inhalation therapy

June 1961
Volume 6 Number 3

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Important

Registry Announcements

Part I of a II part series on

Pharmacology of Inhalation Therapy

Techniques in

Tracheobronchial Anesthesia

Part II of the series on

Infant Resuscitation

JOURNAL OF THE AMERICAN ASSOCIATION OF INHALATION THERAPISTS

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ARTICLES

REGULAR FEATURES

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Heated Hypertonic Aerosol in Collecting Sputum Specimens for Cytological Diagnosis:
David M. Berkson, MD; Gordon L. Snider, MD. JAMA, Vol. 173, No. 2, pp 135-138.

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Registry Announcements

After a long period of study and preparation, the following 35 therapists applied for registration and were found qualified to take the examinations. They have passed both written and oral tests, and at the May 1st meeting of the ARIT Board of Trustees, they were the first group of therapists to be granted registration.

In making the formal announcement at the Tri-State Hospital Assembly meeting in Chicago, Dr. Albert H. Andrews, Jr., President of the ARIT, stressed the point that the idea of registry exams is not to terrorize therapists, but "to give them an opportunity to demonstrate (to the examining physicians) that they *should* be registered."

We want to salute these competent therapists who have earned the distinction they now bear so proudly. We hope the accomplishment of these leaders in the field will spur other experienced workers on to prepare for examination which leads to this formal recognition of their professional abilities.

The original group to be registered are as follows:

Sister M. Arnoldine
Fort Wayne, Indiana
Sister M. Audrey
Streator, Illinois
Robert Bevan
Albuquerque, New Mex.
Sister M. Blanche
Zanesville, Ohio
Dorothy Braeger
Milwaukee, Wisconsin
Orlie Branch
Kalamazoo, Michigan
Constance Cypert
Covina, California
Basil D'Arcy
Bay City, Michigan
Donald D'Arcy
Bay City, Michigan
Jerome Heydenberk
Kalamazoo, Michigan
John Julius
New Haven, Conn.
Bernard Kew
Lakewood, Ohio
John W. Kisala
Chicago, Illinois
Joseph J. Klocek
Richmond Hill, New York
Abraham Lister
Hillside, New Jersey
Sister Margaret Mary
Chicago, Illinois
Ralph E. Mills, Jr.
Catawissa, Pennsylvania
Robert Dittmar
Springfield, Ohio
Agnes Forrest
Chicago, Illinois
Cilli Frankenburger
Chicago, Illinois
Joseph Freeman
Warren, Ohio
William Gallagher
Chicago, Illinois
Jack Gargon
South Norwalk, Connecticut
Ilse Geldern
Chicago, Illinois
Don E. Gilbert
Ann Arbor, Michigan
Leonard Gurney
New Bedford, Mass.
James E. Peo
Wilmington, Delaware
Noble Price
Indianapolis, Indiana
Gerald Robinson
Miami, Florida
Samuel Runyon
Kansas City, Kansas
Emil Stary
Berwyn, Illinois
Leah Tharaldson
Minneapolis, Minnesota

James F. Whitacre
Rochester, New York
J. Addison Young
Chicago, Illinois
Sister M. Yvonne
La Crosse, Wisconsin

Other points which Dr. Andrews brought out in his address were as follows: (1) Re-registration is not required until January 1st after the anniversary of registration. (2) Owing to the multitude of technical details in the preparing and giving of exams, it will be impossible to make exceptions to the examination schedules, or to give special exams. (3) With regard to the vital matter of medical supervision, Dr. Andrews stated, "There *must* be a physician who has responsibility and authority at the clinical level." The ticklish problems surrounding this type of supervision for service company therapists have not yet been worked out, and after much discussion and consideration at the meeting it was necessary to table the matter until the fall meeting, or until some solution can be found.

The next examinations for registration will be this fall. The written one, to be given simultaneously in several cities, depending on geographical locations of persons applying, will be on Saturday, September 23, 1961. Candidates will be notified directly by the Registrar when the places have been decided.

The ensuing orals are to be given in conjunction with the Annual Meeting of the AAIT at Buffalo November 6-9, probably on Sunday, November 5. Those passing the written exam will be notified of the exact time and place during October.

Deadline for receipt of completed applications for these exams is July 15. (In other words, applicants must write the Registrar to obtain the Application Form in sufficient time to get it completed and returned to her by that date). Please note one other important bit of information: a change in the original instructions has been made. Instead of sending the whole $25 registration fee in with the application, as before directed, the application is to be accompanied by only $5, which is a processing fee that is not refundable. The remaining $20 of the examination and registration fee is to be forwarded after the Admissions Committee approves the application.

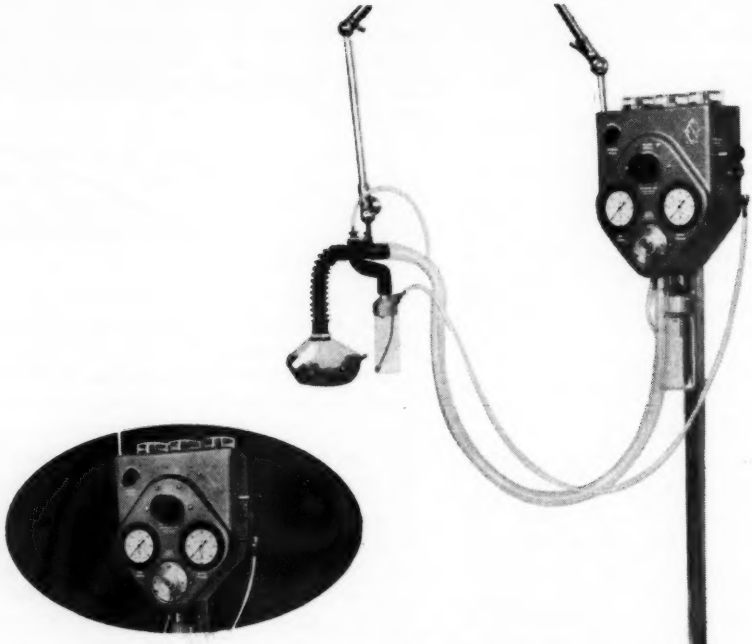
A word of explanation is in order to help candidates understand the need for this high a fee, and also the rigid time schedule we have to adhere to in conducting these exams.

A minimum of a month's time is required after receipt of applications for the Registrar to correspond with AAIT Headquarters, the medical supervisors of the candidate and his other references, to convey this to the Admissions Committee and then the Committee to meet and consider the material.

After they find a candidate qualified or unqualified, he must be notified, and if qualified, (be assigned an identification number). It may not be possible at that time to inform him of particulars of exam time and place, because these things must be determined after all applications have been considered.

Meanwhile the Questions Committee is working on questions for the exam, which they send to the Examination Committee. The exam is drawn up and proctors must then be found in each of the proposed cities where it is to be given. This requires much correspondence ***which cannot even be begun*** until after applications are processed, because only then can the Board decide where exams should be given.

It is hoped that this brief account of some of the necessary steps helps clarify the need for time and for sufficient funds to conduct all the correspondence, phone calls, examination and form printing, office supplies, and other things essential to the operation of the Registry. It is important to point out that all of the members of the Registry Board are donating their time to this and have other full-time obligations. They are eager to serve the candidate to the best of their ability, and it seems the only way to do it is to allow ample time to get the necessary steps accomplished.



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Pharmacology of Inhalation Therapy: Part I
Do you understand the drugs you use?

by Melvin H. Hall

WHAT is Pharmacology? Webster defines it as follows: "The science of drugs, including materia medica and therapeutics; often specified as pharmacodynamics (that branch of pharmacology which deals with the reactions between drugs and living structures). The materials of this science; the properties and phenomena of drugs, especially with relation to their therapeutic value."

In the broadest sense, pharmacology is the study of the changes produced in living animals by chemical substances (except foods); the animals may include any species from microorganisms to man.

The term "pharmacology" is used sometimes, in a more restricted sense, to refer to the study of the action of drugs, that is, agents used to treat diseases. This represents the most important application of pharmacology and explains its place among the medical sciences. It is clearly distinguished from pharmacy, the art of preparing drugs for use; but is closely related to therapeutics, the application of drugs to the treatment of disease, and to toxicology, the study of poisons and poisonings. Both of these may be considered to be specialized applications of pharmacology. In a practical sense, pharmacology is the experimental science on which therapeutics is based, since the safe and effective use of drugs in the treatment of diseased patients is possible only after careful observations of their effects in the laboratory.

Mr. Hall is chief inhalation therapist at Variety Children's Hospital in Miami, Florida.

Certainly no paramedical specialty could be more interested in or related to pharmacology or pharmacodynamics than Inhalation Therapy. Each day, and very often every hour of the working day, the inhalation therapist finds himself in close contact with various types of drugs, and is very often asked by his medical director, or the resident, intern or physician how a certain patient is reacting to a specific detergent, a special type of antibiotic, or a new bronchodilator or antihistamine which has been introduced on the market.

The drugs that are employed by the inhalation therapist or anesthesiologist are so varied in chemical types and pharmacological effects upon the subject that generalization cannot be applied to cover the whole field. In addition to those agents that are used primarily for their anesthetic, hypnotic, or narcotic effects upon the patient, members of several groups of drugs are used to augment the desirable or to correct some of the undesirable effects produced by the primary anesthetic agent being employed.

The inhalation therapist must have a good comprehensive knowledge of certain drugs and their possible effects upon the patient. He must be aware of those condi-

tions which may contraindicate the use of certain drugs such as stimulants. He must be a therapist in every sense of the word. *To give inhalation therapy is not difficult; but to give safe inhalation therapy is.* The inhalation therapist must be aware of the fact that some or certain drugs which he may employ during his therapeutic administration can be potentially dangerous. The success with which any of these is used depends less on the qualities of the agent itself than on the inhalation therapist's knowledge of it, and his skill in its administration.

The administration of agents by way of the respiratory tract is an important method in the treatment of disease. Oxygen, carbon dioxide, and helium have been thus long employed. More recently drugs in the form of nebula have been administered, using air or oxygen as the vehicle. Oxygen therapy may be employed for the prevention or treatment of oxygen deprivation, the removal of gaseous accumulations in the body, and as a vehicle as before stated for aerosol administration.

Inhalation is used for gaseous medicines, such as anesthetics or oxygen. The effects depend on the *concentration* of the gas, and the *time* during which it is administered. The rich capillary area of the alveoli (which in man covers nearly a thousand square feet, 90 square meters) is one of the best absorbing surfaces, so that the action is very rapid.

WHAT ARE AEROSOLS?

Aerosols (mists, nebulized sprays) are dispersions of very minute particles of solids or liquids in air or any gaseous medium. They may be used for general systemic effects via absorption as well as for the local action of the suspended substances. Particles 0.5 micron or smaller reach the alveoli and act immediately if the suspended substance is absorbable—especially if the breath is held for a few seconds at the end of inspiration.

Aerosols also include dusts, smokes, fumes, clouds, fogs, mists, and smogs. Their stability depends on small and practically uniform sized particles, nearly all under one micron, for the larger particles tend to increase in size by adsorption of the smaller. (Adsorption is that power, apart from capillary attractions, possessed by certain substances of taking up fluids.)

The size of the particles also determines the depth of their penetration into the respiratory tree. In man, particles of 0.3 to 0.5 microns pass readily into the alveoli, permitting rapid absorption. Those larger than 10 microns are mostly deposited on the bronchiolar mucosa. In smaller animals, very few of 1 to 3 microns size reach the alveoli. They are deposited in progressively decreasing amount in the oropharynx, larynx, bifurcation of the trachea, and to a small extent in the bronchi and bronchioles.

The efficiency of the nebulizing apparatus is therefore important. Some commercial aerosol generators produce a mean size of 0.5 microns; but others make particles of 25 microns and larger, which are therefore confined to the upper respiratory tract.

With dusts, the upper respiratory tract of man retains practically no particles below 1 micron in size; but with 0.25 microns part is again exhaled, so that the maximal alveolar retention occurs at 5 microns.

With oil aerosols the particles of vegetable oils are gradually absorbed, but mineral oil remains and produces localized foreign-body reactions of moderate severity. Cod liver oil also produces some irritation. With vegetable oils, this is negligible.

The lungs also absorb fluids and dissolved substances rapidly, if these are introduced through the trachea. The absorption of fluid from the lungs far surpasses ordinary conceptions. For instance, 30 liters of water were passed into the trachea of a horse. Instead of killing the animal, the water was absorbed.

Absorption of dissolved substances from the lungs is also rapid. If ferrocyanide in solution is injected into the trachea, it can be demonstrated in the carotid blood in two minutes.

ANTIBIOTIC SUBSTANCES

This title is applied in a restricted sense

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Aerosol technique described for tracheobronchial anesthesia

by Joseph B. Miller, M.D., Norman Dinhoffer, M.D. and William H. Conyers, Jr., M.D.

THE roentgenological visualization of the bronchial tree by the introduction of a radiopaque material was first successfully employed in humans in 1918.[5] Since then a great many techniques have been described to improve or simplify this procedure. The recognition of lipiodol as an excellent radiopaque material for bronchography in 1921 was perhaps the first and greatest advance along these lines.[13]

The chief remaining difficulty has been in methods of securing adequate topical anesthesia with such agents as cocaine and pontocaine. Despite much investigation, this field has remained relatively static until the recent development of an aerosol technique and an aerosol anesthetic solution[7,8,9] which make the procedure simple, safe, and almost entirely free from discomfort.

The aerosol technique consists in having the patient simply inhale a mist of the nebulized solution. This is entirely different from the older method of atomization. Atomization (spraying) is the production of relatively large droplets which, when striking the pharynx, cause gagging and coughing. Nebulization is the production of a fine mist of suspended droplets of 5 micra or less in diameter which may be inhaled comfortably and carried by convection into the bronchial passages. From the standpoint of increased ease of administration, smaller amount of anesthetic solution required, and almost complete lack of discomfort to the patient, this is a great improvement on the standard techniques of atomization, swabbing, and tracheal instillation.

The early employment of this method of anesthesia in children convincingly demonstrated that, in order to evolve a single procedure that would be effective and applicable to patients of all ages, it would be necessary to occlude the external nares, generate the aerosol into the mouth in a continuous stream, have the patient hold his tongue forward with gauze, and attach to the nebulizer a rubber mouthpiece 3 inches long so that the point of delivery could be advanced toward the larynx as anesthesia progressed.

Further use of the technique disclosed occasional irregularities in the depth and distribution of anesthesia as well as in the time required for anesthetization. Pharyngeal and laryngeal anesthesia was regularly obtainable in less than twenty

minutes, but tracheobronchial anesthesia was usually slower and less reliable. After a prolonged study of the factors involved, it became apparent that the difficulty was based on the extremely small size of the aerosol particles. The process of nebulization breaks the solution into millions of tiny particles, thus enormously increasing the surface area of the solution. This in turn causes the particles to evaporate at an extremely rapid rate. It has been shown that atomized particles of 10 micra and below completely evaporate within 0.02 second after production.[14] An aqueous aerosol can be observed to disappear completely within about 3 to 6 inches of the mouth of the nebulizer. Therapeutically, this results in a relatively small amount of deposition on the respiratory mucosa beyond the pharynx and larynx. The reduced size of those particles that are deposited results in a slow coverage of the mucosa, since a great many of these tiny particles must be deposited before there is a sufficient number of coalesce and form a continuous film.

These difficulties are entirely overcome by adding the proper concentrations of glycerin and detergent to the solution. Abramson[1] contributed the significant fact that glycerin tends to hold on to the water in the droplet, thereby inhibiting evaporation and stabilizing particle size. This results in deeper penetration of the mist into the bronchial passageway. However, glycerin alone does not necessarily result in increased deposition, since the stabilized droplets tend to maintain their integrity and to rebound from obstructing surfaces. In fact, recent data demonstrate that strong glycerin solutions may actually deposit to a lesser extent than plain aqueous solutions.[12]. An additional agent is required to lower the surface tension of the droplets, so that they may become disrupted on contact with obstructing surfaces, i.e., to make them "splatter out" rather than bounce off. A surface-tension reducing agent thus causes increased deposition, coalescence of deposited droplets, and formation of a thin but widespread film of anesthetic solution over the mucosal surfaces. When both agents are added, the time required to obtain tracheobronchial as well as pharyngeal and laryngeal anesthesia is shortened and the depth and distribution of anesthesia are made uniformly excellent.*

The detergent employed in this solution is triton A-20. This is the most stable and least toxic detergent available for aerosol therapy, and the one on which the greatest background exists.[2,3,4,6,10,11] It is not precipitated by proteins or digested by tissue lipases as are most other detergents, and so retains its detergency even after being deposited on the tracheobronchial mucosa. Although it is physically active in lowering surface tension, it is chemically practically inert and therefore has a very wide margin of safety.

The phenomena described are real, and can easily be demonstrated objectively. The tendency to evaporation can be observed by visualizing the disappearance of the mist of an aqueous solution within 3 to 6 inches of the nebulizer orifice. The addition of glycerin to the solution results in the production of a dense mist that floats about in the atmosphere for many seconds or minutes. The spreading effect of triton A-20 can be demonstrated by nebuilizing solutions of dyes with and without the detergent for one minute toward moist filter papers. The solution containing the detergent produces a deeply colored blotch of large size, whereas an aqueous solution produces a faint discoloration of small size, and a glycerin solution produces an even lighter-colored area of still smaller size.

Although cocaine is effective in this solution, the preferred anesthetic agent is pontocaine. In therapeutic concentration, it is less toxic and longer acting than cocaine and particularly safer for children. The concentration of pontocaine employed in this solution is 0.5 per cent. This is the minimal effective concentration to completely abolish the cough, gag, and swallowing reflexes. Higher concentrations are

continued on page 24

***This entire balanced solution is known as Pontocaine Hydrochloride Aerosol Solution and can be obtained from Winthrop Laboratories, Inc., 1450 Broadway, New York 18, N. Y.**

Resuscitation of the Newborn: Part II

Here are important steps in treating apnea neonatorum

by Paul R. Knox, LCDR, MC, USN

Having described in the previous issue the peculiarities of the fetal circulatory and respiratory systems which often give rise to respiratory difficulties at birth, Dr. Knox here further classifies them and describes their treatment.—Ed.

THE basic pathological process in apnea neonatorum is usually central nervous system damage or depression. The fundamental pathological lesion is complete atelectasis of the lungs. The lungs are compact, solid visci completely filling the thorax, as negative intrapleural pressure has not been developed.

The changes in blood chemistry include decreased arterial oxygen saturation, elevated carbon dioxide tension, elevated lactic acid level, and fall of pH.

Resuscitation of the newborn is aimed at preventing: 1) death; 2) permanent central nervous system damage due to prolonged anoxia. However, the best treatment for *apnea neonatorum* is prophylaxis —mainly adequate pre-natal care, avoidance of unnecessary obstetrical trauma, judicious use of analgesia and anesthesia to prevent respiratory depression.

Usually an infant at birth will fall into one of the following categories:

1. The baby who exerts no respiratory effort and needs active resuscitation.
2. The baby who breathes spontaneously but poorly and needs his respiratory efforts assisted.
3. The baby who is anoxic but breathing satisfactorily and needs only oxygen.
4. The baby who shows no respiratory depression or anoxa; and into this class falls the vast majority of newborn.

Dr. Knox is on active duty in the Navy, but is assigned for postgraduate work to Duke University Medical Center, where he is an Associate in Anesthesia.

Apgar has developed a system of scoring newborns 60 seconds after birth. Its value lies in its usefulness as a basis for discussion and comparison of obstetrical practices, type of maternal pain relief, effects of resuscitation, etc. Prognosis is good if the infant scores, 8, 9, 10 and poor if score is 0, 1, 2 or 3. 90% of all newborns score 7 or above.

The following discussion is the accepted procedure for the management of all newborn infants.

As soon as the head is delivered, time should be taken to aspirate the nose, mouth and pharynx, as gasping often occurs when the umbilical cord is clamped. And during this gasping, the infant may aspirate any amniotic fluid or cellular debris present in the upper airway.

The infant's head should be kept down during the remainder of delivery as gravity is an important aid in drainage of fluid from the respiratory tract.

Much has been written as to the value of the blood in the placenta and the baby's position in relation to the placenta. General agreement now seems to be that an effort should be made to add this blood to the infant's circulation. A fast way to accomplish this is to hold the infant below the mother, and then gently strip the cord 8 to 10 times—and then clamp the cord even if it is still pulsating. It may be 20 minutes before the cord quits pulsating, but ¾ of the blood in the placenta will be returned to the fetus within 3 minutes. If the factors of iso-immunization or transplacental narcosis are present, the cord should be clamped immediately. Also there may be a danger of making the premature infant hypervolemic by adding this blood to his circulation.

Once the cord is clamped, the infant should be placed in about 15 degrees Trendelenburg—whether in a bassinet or the commonly used Kreiselman resuscitator—here again to aid in drainage of fluid from the tracheo-bronchial tubes. It is interesting to note that in 1930 Murphy reported that when newborn cats were placed in the horizontal or head-up position and fluid introduced into the trachea, this fluid would be found throughout the lungs. But when these kittens were placed in 15 degrees Trendelenburg, they could not aspirate this fluid that was introduced to the trachea. More than 30 degrees Trendelenburg will aggravate a tendency to cerebral hemorrhage. However, once respirations are well established and the upper airway has been thoroughly aspirated, the head-up position allows for better expansion of the lungs.

The infant now should be made to cough or sneeze by putting a soft rubber catheter just inside the nostril. This coughing and sneezing aids in cleaning out any remaining fluid or cellular debris from the tracheo-bronchial tube. The pharynx is suctioned again briefly. *Any prolonged suctioning leads to hypoxia rapidly.* Usually the infant has started to breathe and cry by this time—if he hasn't done so before.

It might be well to mention that considerable time can elapse while aspirating the upper airway. However, this aspiration of the upper airway should be accomplished with dispatch, as the infant may still have respiratory difficulties which should be attended to immediately.

Now the problem of respiratory depression. As indicated above, the infant may be breathing well, but is rather cyanotic and needs only oxygen by mouth; or he may be breathing poorly and require respiratory assistance; and finally there is the apneic infant who has made no effort to breathe and needs active resuscitation. If resuscitative measures are to be effective, the infant must make at least one gasp on his own to help start his lungs expanding.

When active resuscitation is necessary, a free airway is essential. Often if the infant is limp, his tongue will obstruct his airway—so a small oropharyngeal airway should be inserted, as well as holding his jaw up. If the infant is still obstructed when efforts are made to raise his chest, the larynx should be exposed as occasionally blood clots and other cellular debris

continued on page 26

Sign	0	1	2
Heart Rate	Absent	Slow (less 100)	Over 100
Respiratory effort	Absent	Slow, irregular	Good, crying
Muscle tone	Limp	Some flexion of extremities	Active motion
Response to catheter in nostril	No response	Grimace	Cough or sneeze
Color	Blue, pale	Body pink, extremities blue	Completely pink

Your Association—And How It Operates

ORGANIZING and operating an association the size of the A.A.I.T. is no little job. Because we are often absolutely appalled at some of the comments made and questions asked by well-intentioned people concerning the cost of running a large association, we thought it about time to prepare a few articles describing exactly what goes on at headquarters. Just what is it we do? Who does it? Why? And what does it cost?

Briefly, there are a number of people working to operate and to enlarge the scope of the American Association of Inhalation Therapists.

On our staff are the following: Miss Sandy Hamen, Secretary; Frank Huston, who is both Convention Manager for our Annual Meetings, and Production Manager for "Inhalation Therapy"; James Whitacre, who serves as Editor of the journal; and Albert Carriere, who is the Executive Director.

Miss Hamen is a graduate of Senn High School and has an Executive Secretarial Certificate from Moser Secretarial School. She is a resident of Chicago, Illinois.

In this first article let us take the duties and responsibilities of Sandy Hamen.

First, as you can see from her picture, Sandy is an attractive young lady, a redhead, who has a pleasant, outgoing personality, and who came to us just out of Moser Secretarial School.

Her job is an important one, a responsible one, and often a tough one.

Her first responsibility is to handle our tremendous correspondence, typing letters for both the Executive Director and for the Production Manager. The correspondence is heavy, and as the A.A.I.T. grows, naturally, the burden of letter writing gets heavier.

Another chore which Miss Hamen handles is the supervision of all membership records, dues payments, billing, and sending out of membership cards, and the maintenance of an up-to-date membership file.

When an application is received at headquarters, Miss Hamen acknowledges its receipt with a postcard sent to the applicant. Very often, people do not send in their three dollar processing fee, which means that a letter must be written to ask for it.

When twenty or more applications are received, they are sent to the first member of the Admissions Committee in Dallas, Texas.

Mrs. Grace Farley approves or disapproves the applications, and then sends them to New York, where Joe Klocek,

A.A.I.T. President, and Chairman of the Admissions Committee goes through the batch of applications again.

Frequently, Joe will write a half dozen letters asking for further information. If these letters are not answered satisfactorily within a reasonable time, the application is rejected.

After the applications are approved by Joe Klocek, he mails them back to headquarters.

Miss Hamen then sends to each successful candidate a letter signed by the Executive Director, who welcomes the new member, and indicates briefly some of the responsibilities of membership. An invoice goes with each letter, and the new member is told that he will receive his membership card immediately upon the payment of his initiation fee.

When his check is received, a membership card is immediately mailed, and his name is put on the mailing list to receive "Inhalation Therapy" and oll other mailings. Meanwhile, he has been sent a package of general materials, including an annual meeting program and a variety of reprints.

One of the most time-consuming jobs is the keeping up-to-date of the card file.

Because the journal goes to thousands of members and subscribers, we have an average of fifty changes of address per issue. Typing new cards, sending them to the letter ship where the addressograph plates are kept, making new plates, discarding the old, and then sending thé returned journal along to the new address—all these things take an enormous amount of time.

Our chief problem, of course, is people who neglect to notify us of a change of address, and then complain loudly when they do not receive their magazine.

Another demanding job handled by our Secretary is the depositing of all checks received by the A.A.I.T. for all purposes: dues, subscriptions, advertising revenue, annual meeting fees, booth rentals, reprints, and grants.

A regular set of books is kept to coincide with the bank deposits and withdrawals, and all of this is audited yearly by Arthur Anderson & Company. Copies of the report go to all members of the Board of Directors, the Advisory Board, and a copy goes to each chapter.

In addition to taking in money, Miss Hamen also indicates which bills are to be paid—and when. Checks are co-signed by the Executive Director and by the Secretary-Treasurer of the A.A.I.T.

Another job handled by Miss Hamen is the preparation for the annual meeting.

This involves working with Frank Huston and Albert Carriere on the planning for the program. Usually a meeting is held with the members of the Advisory Board, who suggest topics and speakers. Then the Executive Director writes letters to the speakers.

When all have accepted, a program is printed and mailed out to literally thousands of interested persons.

As the registrations come in, Miss Hamen lists them, acknowledges them, deposits the checks received, and for each registrant makes up a kit. These kits and other materials are shipped to the annual meeting place about four or five days before the meeting. (If you'd like to hear a story of utter frustration, ask your Executive Director about the time the express company sent these kits to California instead of St. Louis, Missouri!)

In addition to all these chores, Miss Hamen must attend to about a thousand other things, such as helping with the journal, the newsletter, the various regional meetings, and especially with making sure that your absent-minded Executive Director remembers that he is to lecture in Houston, Texas, or in Montreal, Canada, on certain days. She arranges for his transportation, hotel reservations, etc., and sees that he prepares his speeches in time, and takes along all the materials he'll need.

This is the merest outline of one job being performed by one individual. In the next article, we shall discuss the responsibilities handled by Frank Huston.

CHAPTER ACTIVITIES

by Howard R. Dockham

Chapter Secretaries: Please send reports and notices to the new address:
Howard R. Dockham
4618 East Douglas
Tucson, Arizona

At the February meeting of the GREATER NEW YORK CHAPTER, Mr. Joseph Klocek answered many questions pertaining to the Registry and its functions, as well as giving a background history of the AAIT for visitors and new members.

The film "Physiology of Anoxia, Basis for Inhalation Therapy" was shown by courtesy of the Linde Company.

Mr. Homero Rosado was elected to continue in the post of Treasurer.

At the March meeting of the SOUTHERN CALIFORNIA CHAPTER, the members heard Dr. Hurley L. Motley, Director of the Cardio-respiratory laboratory, University of Southern California School of Medicine, discuss "Intermittent Positive Pressure." Dr. Motley illustrated his lecture with slides. Discussion was held on the proposed idea for a two-day meeting with industrial exhibits and lectures.

At the February meeting of the FLORIDA SOCIETY OF INHALATION THERAPISTS, Dr. Asher Marks, Assistant Professor of Medicine (Division of Pulmonary Function) at the University of Miami, and one of the chapter's advisers, presented a discussion on the physiology and anatomy of the respiratory system.

Dr. George Braun, Chief of the Pulmonary Function division of the Veterans Hospital in Coral Gables, lectured on the "Physiological Aspects of Pathological Respiration" at the March meeting.

On February 28th, the Colorado Chapter of the American Physical Therapists and the ROCKY MOUNTAIN CHAPTER of the AAIT held a joint panel discussion on "Breathing Exercises and Respiratory Physiology" at the Sabin Auditorium in the University of Colorado Medical Center. Mrs. Vivian Curtis, R.N., secretary of the Rocky Mountain Chapter, represented the inhalation therapists on the panel.

At the March meeting, planned as a social evening, Mr. Brockman of the U.S. Bureau of Standards, Boulder, Colorado, demonstrated the properties of liquid Nitrogen.

Annual elections were held at the January meeting of the GREATER WASHINGTON CHAPTER. The results: President, Leslie H. Freedman; Vice-president, Dudley Robinson; Secretary, Easton R. Smith; and Treasurer, Anna H. Early.

The members voted to seek a display booth at the Tri-State Hospital Association meeting in November, to stimulate interest in inhalation therapy. Maryland, Delaware and the District of Columbia are included in the Tri-State Association.

PLEASE NOTE

As a result of a mistake in the mailing procedure of the April issue of *Inhalation Therapy* some of our members may have received journals which indicated they were sent by a service member.

By way of explanation, some of the issues are sent to non-subscribers on a bulk subscription basis as a courtesy of various service companies.

This helps to spread the "gospel" of Inhalation Therapy and the work of the Association to many interested non-members.

We hope the members receiving these copies will understand and forgive this error.

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to chemical substances produced by microorganisms, chiefly but not solely the saprophytic molds and bacteria of the soil. These substances inhibit the multiplication of various microorganisms, or may even destroy them. The restriction is convenient but somewhat artificial, for the antibiotics of microbial origin do not appear to differ fundamentally from antimicrobial substances produced by higher plants, or those produced only synthetically, such as p-aminosalicylic acid, sulfones and others.

The antibiotics act more or less potently on different bacteria, on some protozoa, on rickettsiae, on some virus-like infections such as trachoma, but not on typical virus diseases such as the common cold, influenza, poliomyelitis, etc.

(a) *Penicillin:* This was the first potent antibiotic to be introduced into medical practice. It is still widely used, although it has been displaced by others in some special fields. It has a high potency against susceptible microorganisms, and is practically non-toxic directly with oral and parenteral administration; but *it is apt to produce serious sensitization, especially on topical application.*

Inhalation of penicillin aerosols and dusts, by the mouth or nose, are used for local action on the respiratory tract, especially for sinusitis and bronchiectasis. Decided decrease of gram-positive bacteria. often also of gram-negative may follow 100,000 units given one to three times daily. Considerable penicillin is absorbed, and therapeutic blood levels may be present for five hours. Allergic reactions are infrequent, but there is some danger in asthma.

(b) *Streptomycin:* Streptomycin is a mixture of several antibiotic substances, isolated from suitable cultures of certain strains of *Streptomyces griseus.* It is marketed as the soluble sulfate, and as a streptomycin calcium chloride. This antibiotic substance may be used for inhalation therapy in much the same way as penicillin. The solution should be freshly prepared each day and kept in the refrigerator.

(c) *Tetracycline Antibiotics:* These include Aureomycin and Terramycin, and are derived from a substance called tetracycline ("Achromycin"). They are suppressive rather than completely destructive to the bacteria, and are very effective by both oral and inhalation administration. Usually the latter route is found irritating to mucosa.

(d) *Neomycin ("Mycifradin") Sulfate:* This antibiotic substance was isolated from culture of a soil organism, *Streptomyces fradiae.* It is bactericidal against a wide variety of gram-positive and gram-negative bacteria, including some that are not susceptible to streptomycin. It is not likely to produce resistant strains clinically. This can also be used very effectively via inhalation therapy.

WHAT ARE BRONCHODILATORS?

By this term is meant a substance which dilates (increases inside diameter of) the bronchi and bronchioles.

(a) *Epinephrine:* The levo-form of epinephrine ("adrenaline," "suprarenin") and its derivative norepinephrine (arterenol) are the active principles of the medulla of the suprarenal (or adrenal) gland. They are relatively simple compounds and can be prepared synthetically. Epinephrine solutions are unstable unless a reducing preservative is added. (This is especially true in the presence of high oxygen concentrations.)

The typical action of epinephrine consists of a highly specific stimulation of the receptive mechanism of the entire sympathetic nervous system, and the effects upon any given organ—whether augmentative, inhibitory or indifferent—correspond with the effects of stimulation of the sympathetic nerves to that organ. The chief effect on the bronchi is one of relaxation of the smooth muscle of their walls, which allows the lumen of the tube to dilate. On the other hand, the smooth muscle of the walls of the *arteriès* in the mucosa lining the bronchi *contracts,* thus narrowing the diameter of these vessels and thereby reducing the amount of blood in them. This further widens the airway tubes by diminishing the encroachment on the space presented by gorged blood vessels that stick out into it.

The most important practical manifestation of the sympathetic stimulation consists of a marked rise of blood pressure, from peripheral stimulation of the vasoconstrictor mechanism of the systemic vessels and of the accelerator mechanism of the heart. This is an undesired "side effect" which accompanies the desired bronchodilation. The response to epinephrine is relatively good in such sensitive cases as asthma or in hypersensitive individuals. *Overdoses of this stimulant, as well as ephedrine and benzedrine, can kill by acute dilatation of the heart.* In man, 1 milligram of epinephrine hypodermically increases the respiration volume by about 50 per cent.

(b) *Isoproterenol or Isopropyl-arterenol hydrochloride:* More commonly known as "Isuprel," and sulfate or "Norisodrine" differ from epinephrine chiefly by producing much stronger bronchodilatation and practical absence of vasoconstriction. Isuprel is used in the treatment of asthmatic attacks and may succeed when epinephrine fails. It is usually administered by inhalation of aerosols or nebulized powders.

Isuprel is so far one of the most potent agents for bronchial dilation affecting the alveolar ducts and infundibula, perhaps also the alveoli, as well as the bronchial system. It tends to liquefy bronchial mucus. Aerosols of 0.2 per cent often suffice for dilation, but sometimes not, partly because the isoproterenol is oxidized in spraying. With 1 per cent solution, a few deep breaths produce bronchial dilation and thereby a decrease of alveolar CO_2. This relieves the dyspnea of asthma and counteracts the constrictor action of dust. Oral inhalation of the 1:200 solution is used as an adjunct in treating chronic pulmonary emphysema. It may be useful to promote the access of penicillin and sulfonamide aerosols to the alveoli.

(c) Other Bronchodilator Agents: By aerosol inhalation in man, Neosynephrine ranks next to Isuprel; then, in order of decreasing potency: amphetamine, d-desoyephedrine, ephedrine, and epinephrine. These require higher concentrations than does Isuprel.

Part II will appear in the August issue

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not employed as they are unnecessary and it is important that the total dose be as small as possible. The aerosol technique results in the deposition of about 15 per cent of the total amount nebulized,[7,8,9] i.e., 1 cc. of 0.5 per cent pontocaine, which is a total dose of only about 5 milligrams. This is a relatively minute amount as compared to that of standard procedures (40-100 mg.) and is far below the recommended maximum dose of 20 mg.

OUTLINE OF PROCEDURE

Materials.

1. DeVilbiss No. 40 nebulizer with rubber stopper in side vent, and with rubber mouthpiece 3 inches long and ½ inch in diameter attached to oral end of nebulizer.

2. Oxygen tank and gauge (or motor-driven air compressor) with tubing connecting to nebulizer.

3. Anesthetic solution (described above).

4. Adhesive tape, 1 inch wide, for occluding nostrils.

5. Gauze squares for holding tongue forward.

Preoperative Orders (dosages appropriate for age).

1. Postural drainage on arising (if secretions are copious).

2. No breakfast and nothing by mouth.

3. Nembutal, two hours before bronchography.

4. Morphine or codeine sulfate (½ hour before bronchography).

5. Atropine sulfate (½ hour before bronchography).

6. Postural drainage on return to ward or home, 30 minutes, once.

7. No food or fluids until ½ hour after bronchography.

Technique of Anesthesia

1. Introduce 8 cc. of anesthetic solution into the nebulizer and close the side vent with the rubber stopper.

2. Tape off the nostrils so that the patient must breathe through the mouth, and have him pull the tongue forward with a gauze square. Demonstrate the mist to the patient and have him hold the rubber mouthpiece of the nebulizer to his mouth and inhale the mist.

3. Use an oxygen flow of 6 liters per minute for the first 5 minutes while the patient inhales the mist; then continue at 10 liters per minute until the *entire solution* is nebulized.

4. During nebulization have the patient change the direction of the mouthpiece in such a way that he obtains a direct impact on the lateral walls of the pharynx as well as in the midline, and have him gradually advance the mouthpiece deeper into the pharynx as the anesthesia progresses.

5. Remove the adhesive tape from the nostrils, and have the patient disrobe to the waist in preparation for roentgen examination.

COMMENT

The technique described is very effective in obtaining bronchograms, particularly in children and apprehensive adults. It is relatively simple as it requires no endoscopic manipulations. It is safer than conventional methods, as it utilizes much smaller amounts of pontocaine. Finally, it is almost entirely free of discomfort to the patient.

These factors make it a procedure of choice for the occasional bronchographist. In addition, the technique is easily adapted for the busy clinic by adding one or two Y-tubes to the oxygen or airline, thereby enabling 2, 3, or more patients to be anesthetized simultaneously. A cheap commercial air-compressor of the type used for paint spraying will produce suffi-

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cient pressure to operate four to eight nebulizers simultaneously. Thus, one trained assistant—an inhalation therapist—can handle all the anesthetizations, supplying the physician with an anesthetized patient every few minutes.

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will block the larynx—this is easily removed by direct suctioning. Often an endotracheal tube is inserted in the severely depressed baby, not only because of his flaccidity and the associated difficulty in maintaining an airway, but also it is easy to distend the stomach with any positive pressure exerted by a mask and bag.

Now the problem of getting the infant's lungs expanding and respiring. As indicated previously, all the methods that have been used will be to no avail unless the infant has made at least one gasp on his own. However, at least one gasp usually has been taken by this time. The recommended practice now is the use of gentle external friction or passive movements of the extremities when attempting to obtain this initial gasp. The older methods of slapping, hot and cold water, and general cough treatment are generally more often harmful than beneficial.

Once this gasp has been taken, some means of artificial ventilation is necessary. The manual methods of artificial ventilation are of no value and frequently do harm in that the intracranial pressure may be increased, the liver may be ruptured, etc.

The best way of providing ventilation is by some method of intermittent positive pressure breathing. This brings up the problem of how much pressure can be exerted to expand the lungs without actually rupturing the alveoli. The initial expansion of the lungs requires more pressure than succeeding respiration.

The majority opinion seems to be that with 20 cm water pressure there is no great danger of alveolar rupture—however, it has been reported that it sometimes takes up to 45 cm water pressure to expand a newborn's lungs. But pressures as low as 25 cm water pressure and as high as 95 cm water pressure have been found necessary to rupture the alveoli. However, the time over which this pressure is exerted is an extremely important factor. Low pressure applied too long will cause alveolar rupture. The high pressures noted above were for only 0.2 second.

The oldest method of intermittent positive pressure breathing is mouth-to-mouth. This is recommended only if there is no other way available, in which case it should be a series of short puffs—like blowing small smoke rings. This method exerts about 20 cm water pressure.

There have been numerous types of mechanical resuscitators and respirators designed for the newborn, but none of these has proved completely satisfactory. The commonly used Kreiselman resuscitators exert a positive pressure of only 16 cm water, while often 20 cm are needed. The following is a list which was compiled by the Special Committee on Infant Mortality of the Medical Society of the County of New York and considered essential in a respirator:

1. It should cycle automatically when applied to the apneic patient, but it should also be able to synchronize with the spontaneous respiratory efforts of the patient.
2. It should indicate the tidal exchange being obtained and should be adjustable so that adequate tidal exchange may be effected in the presence of wide variation in the patient's resistance and compliance.
3. The maximum and minimum tripping pressures should be independently adjustable so that the mean mask pressures obtained may be adjusted upward or downward.
4. It should be provided with an adjustable manual over-ride for maximum pressure.
5. The resistance of the valves should be low and non-restricting to patient-initiated flow.
6. The connecting piece (for mask or endotracheal tube) should be easy to apply so as to maintain an adequate fit without interfering with the airway.

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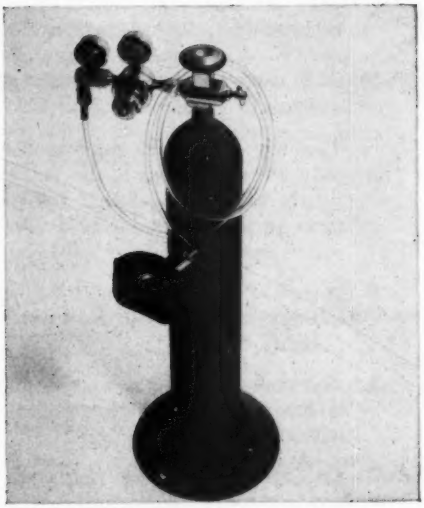

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7. The duration of application of positive and negative pressures should be independently adjustable.

This committee found that some 21 respirators were available, but not one of these met all of these requirements. In fact many feel that mechanical respirators are not indicated for the newborn and not infrequently may make for more complications. Probably the most commonly and easily used method is bag and mask (or bag-to-endotracheal tube). Despite the fact that the mouth-to-mouth procedure is not recommended by some authorities, it is always available and does not get out of order.

There seems to be general agreement that the use of oxygen is indicated, although many recommend the use of 40% oxygen in air. But for a short time use, as in the delivery room for resuscitative measures, 100% oxygen will not harm the infant. However, much has been said in the past about using 100% oxygen in newborns over a prolonged period—namely pure oxygen can cause secondary atelectasis, pulmonary hemorrhage, and in the premature, retrolental fibroplasia. Reports have appeared recently in the literature on the use of intragastric oxygen in the apneic newborn; however, its value is questioned.

Analeptic drugs are of no value in the treatment of asphyxia neonatorum. However, narcotic antagonists are of value when the respiratory depression is due to narcotics. The usual dosages recommended are Nalline 0.2 mg or levallorphan 0.25 mg—diluted and injected into the umbilical vein. Needless to say, carbon dioxide plays no role in the therapy of this condition.

Mention should be made of the practice of emptying the newborn's stomach. This should be done routinely, but only after the airway has been cleared and respirations have been well established. Often the infant's stomach will contain a fair amount of fluid. The aspiration of this fluid may well prevent respiratory complication or even death due to regurgitation of this fluid later when the infant is left unattended. Also, just the passage of the catheter may aid in the diagnosis of tracheoesophageal fistula or upper bowel obstruction. In the former condition, the catheter can't be passed and in the latter excessive amounts of gastric content will be obtained.

A commonly held belief has been that the newborn should be kept warm. However, with the development of clinical hypothermia, the question arises whether it would be of value in the severely depressed infant. A full-term infant's body temperature is frequently 2-3° F below normal—while a premature's may be as much as 8° F below normal—and they frequently remain at these lower levels for one to two weeks without apparent harm. The present practice, however, is the avoidance of any active measures to increase the temperature—mainly avoiding hot water bottles, warm blankets, etc.

Controlled studies have not indicated that excessive humidity or vaporization of one of the various wetting agents increases the survival of these infants.

Another word about prenatal prophylaxis: Cerebral hemorrhage is often a cause of apnea neonatorum, and this may be due in part to the fact that prothrombin levels are frequently low (14-30% of normal) in the newborn. And it has been found that the prenatal administration of vitamin K would increase the infant's prothrombin level several-fold—even when given as late as 4 hours prior to delivery; also the incidence of cerebral hemorrhage was less.

The current concepts in this country regarding resuscitation of the newborn seem to stress *gentle* handling, prompt establishment of a clear airway, the use of oxygen and if necessary intermittent positive pressure breathing. Eastman first emphasized these principles in 1940, and little has been added to the treatment except a variety of complex apparatuses for artificial ventilation.

An interesting idea of newborn resusci-

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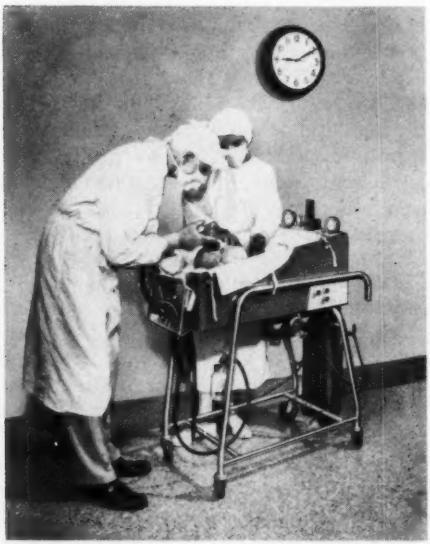
tation was reported in a recent issue of the Journal of Obstetrics and Gynecology of the British Empire. Their thesis is that all full term infants will breathe eventually unless they are severely damaged. So they make no effort to give the infant any oxygen while in the delivery room and at no time is artificial ventilation used. In a series of 641 cesarian sections done under general anesthesia, 30 infants who did not establish respiratory activities for over 20 minutes were so treated and there were no fatalities—(of course, one wonders about permanent C. N. S. damage).

In review then, the basic factor underlying apnea neonatorum is usually a depressed or damaged central nervous system due to cerebral hemorrhage, intrauterine anoxia or other agents causing depression. The best treatment is prophylaxis; but if it does occur, then prompt establishment of a free airway, administration of oxygen and if necessary intermittent positive pressure breathing and gentle handling are usually the only indicated measures.

***"The statements made herein do not necessarily reflect the opinion of the Navy Department."**



Model 24 Kreiselman Infant Bassinet Resuscitator in use. Courtesy Ohio Chemical & Surgical Equipment Company, a division of Air Reduction Company.

EQUIPMENT NEWS

(Information and photographs are supplied by the manufacturers or distributors.)

The Mistogen Equipment Company of Oakland, California, has announced the introduction of a revised "Mainstream" heated nebulizer for use with IPPB units.

It is said to interfere in no way with the maximum efficiency of the IPPB valve. The heating unit is easily detached from the plastic reservoir, and does not come into contact with the aerosol solution. The plastic reservoir may be cleaned separately without damage to the electrical heating unit.

It is adaptable to all IPPB equipment. **No. 631**

Walton Laboratories, of Irvington, New Jersey, has introduced the "Thera-Mist," a centrifuge-type high humidity generator. It guarantees an output of 2½ gallons per day of the cold vapor familiar to users of other Walton humidifiers.

It is claimed to be suitable for areas up to 4000 cubic feet—a good sized room, and is the first Walton unit offered in a price range that really competes with other humidifiers on the market for home use.

It is portable, lightweight and has a relatively maintenance-free pump which operates 12 hours on one filling. It contains no delicate plastic parts. **No. 632**

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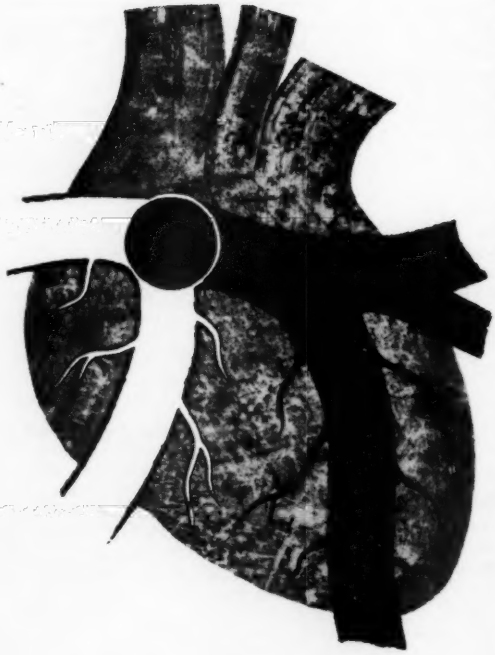

"The use of oxygen in myocardial infarction is no longer a desperate or heroic measure. The principle of rest for the heart would require that oxygen be used for the patient who is cyanotic, dyspneic, in shock, in pulmonary congestion or edema, or suffering from a cardiac arhythmia with rapid heart action. Persisting pain of myocardial infarction may be relieved or reduced by oxygen therapy. In other cases, use of oxygen may well be justified for the first day or two in an attempt to prevent gross anoxia and to compensate for less overt degrees of oxygen deficiency."

***—Early Management of Myocardial Infarction:* B. E. Pollock; Journal of the American Medical Association, 161:404 (June) 1956.**

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